Visual Aids

California Education and the Environment Initiative

E

Earth Science Standard E.4.c.

The Greenhouse Effect on Natural Systems

California Education and the Environment Initiative

Approved by the California State Board of Education, 2010

The Education and the Environment Curriculum is a cooperative endeavor of the following entities:

California Environmental Protection Agency

California Natural Resources Agency

Office of the Secretary of Education

California State Board of Education

California Department of Education

California Integrated Waste Management Board

Key Leadership for the Education and Environment Initiative:

Linda Adams, Secretary, California Environmental Protection Agency

Patty Zwarts, Deputy Secretary for Policy and Legislation, California Environmental Protection Agency

Andrea Lewis, Assistant Secretary for Education and Quality Programs, California Environmental Protection Agency

Mark Leary, Executive Director, California Integrated Waste Management Board

Mindy Fox, Director, Office of Education and the Environment, California Integrated Waste Management Board

Key Partners:

Special thanks to **Heal the Bay,** sponsor of the EEI law, for their partnership and participation in reviewing portions of the EEI curriculum.

Valuable assistance with maps, photos, videos and design was provided by the **National Geographic Society** under a contract with the State of California.

Office of Education and the Environment

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http://www.calepa.ca.gov/Education/EEI/

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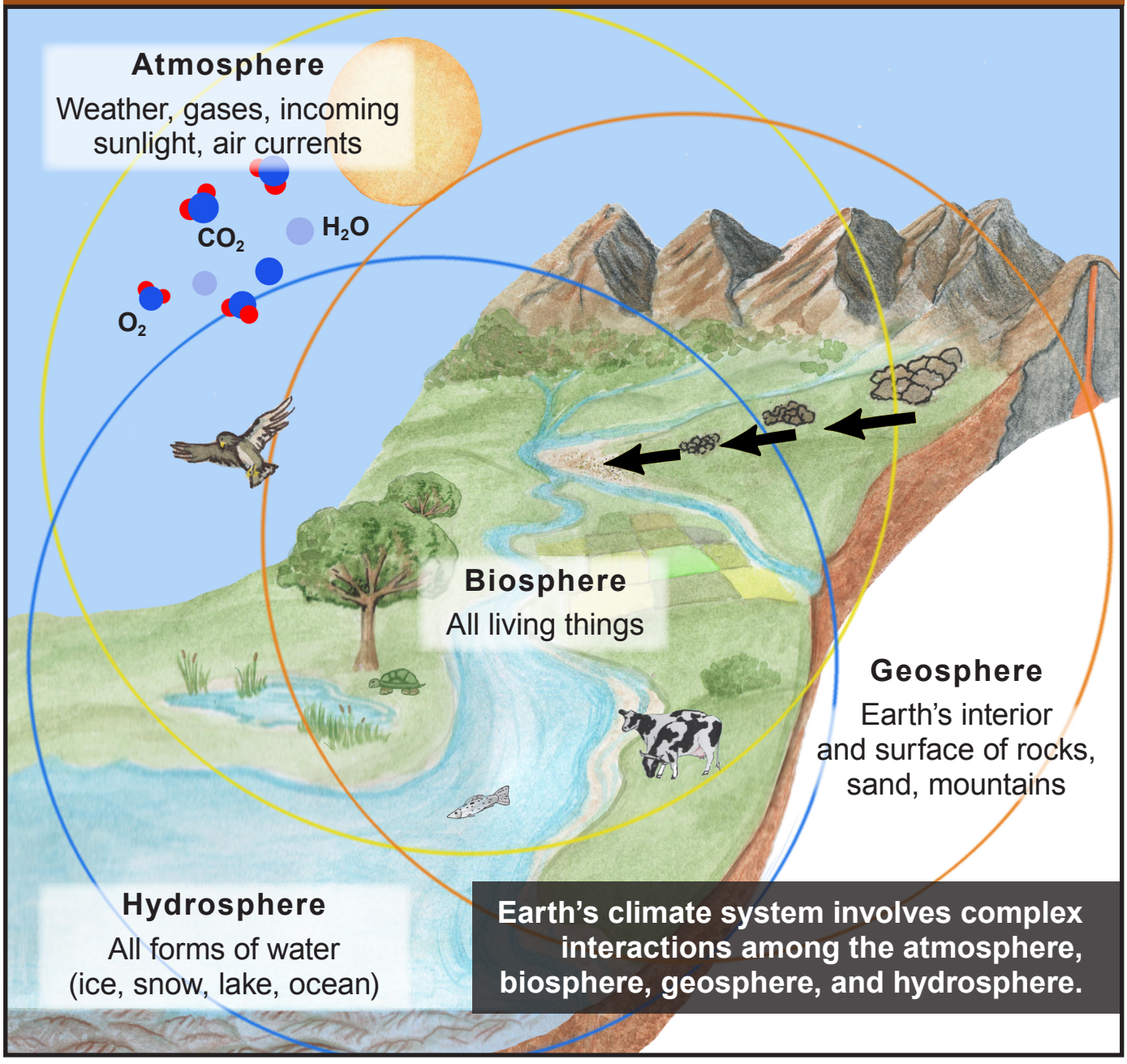
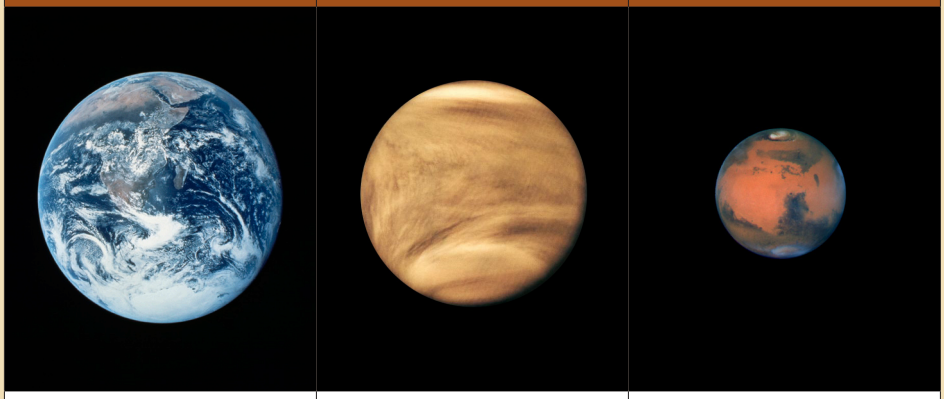
VA #1 California 18,000 Years Ago

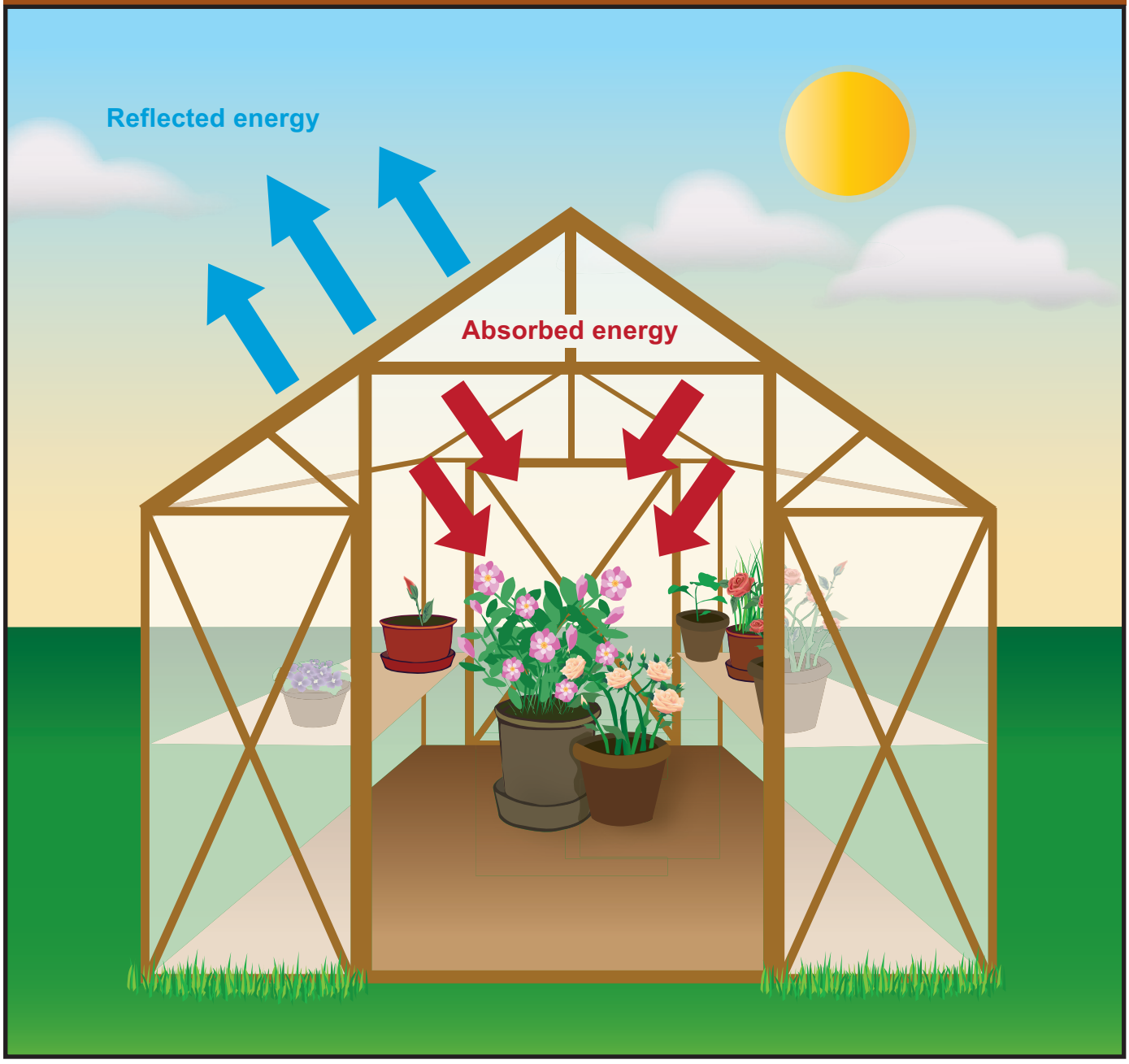
VA #2 Earth's Climate System



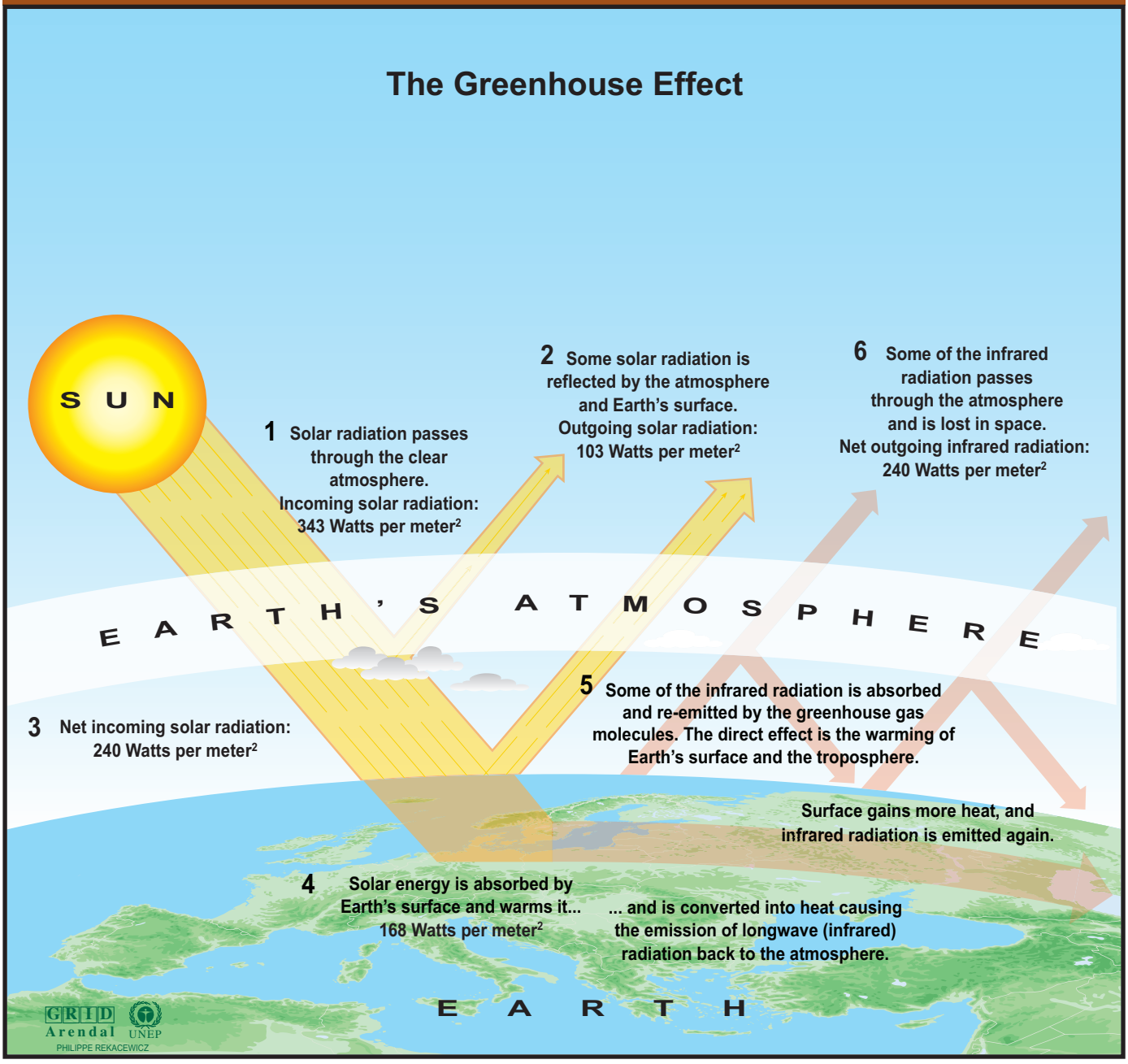
VA #3 Atmospheres of Earth, Venus, and Mars

	Earth	Venus	Mars
			
Carbon Dioxide (CO_2)	0.030 %	96.500 %	95.000 %
Nitrogen (N_2)	78.000 %	3.500 %	2.700 %
Oxygen (O_2)	21.000 %	Trace	0.130 %
Argon (Ar)	0.900 %	0.007 %	1.600 %
Methane (CH_4)	0.002 %	0 %	0 %
Nitrous Oxide (NO_2)	Yes	No	Yes
Water Vapor	Yes	No	No

VA #4 A Greenhouse



VA #5 Earth's Greenhouse



VA #6 San Luis Reservoir, California

VA #7 Other Greenhouse Gases

Chlorofluorocarbons (CFCs, HCFCs)
Hydrofluorocarbons (HFCs)
Perfluorocarbons (PFCs)



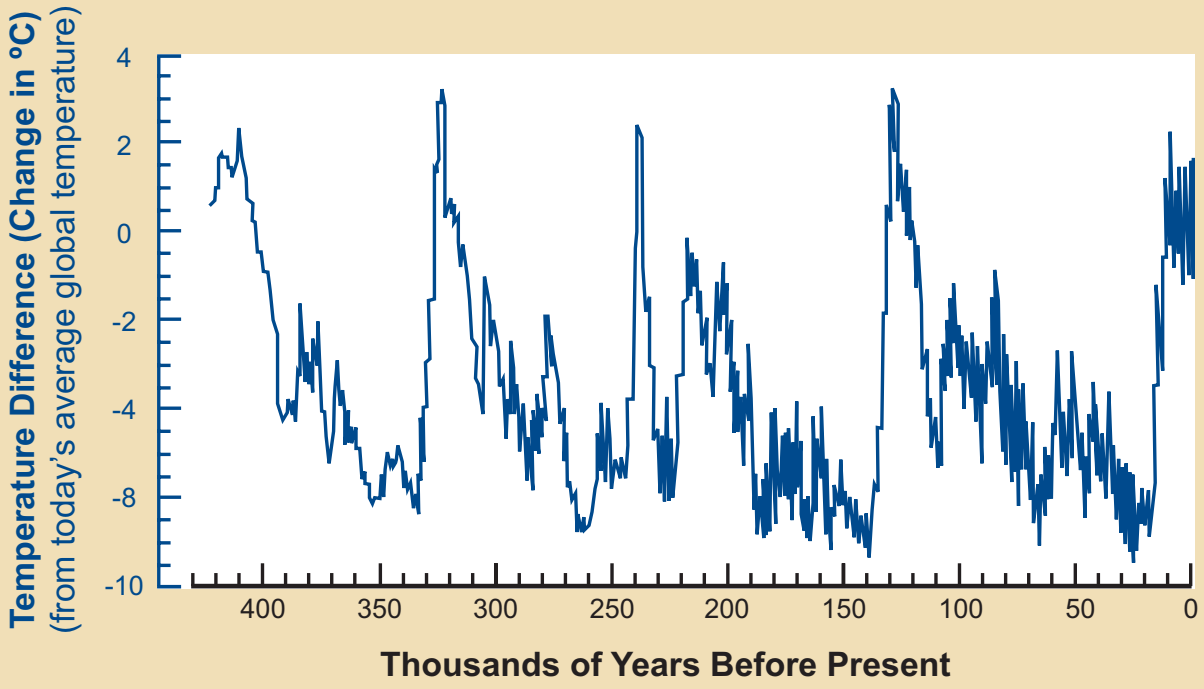

Found in aerosol sprays (spray paint, cooking spray), dry cleaning fluids, air conditioning, refrigeration, and medical supplies.

Sulfur hexafluoride (SF_6)
Nitrogen trifluoride (NF_3)


Used in electronics, as well as processing and manufacturing of semiconductors, like solar panels.

Sources of these GHGs: Human activity (only)
Sinks of these GHGs: The atmosphere (only)

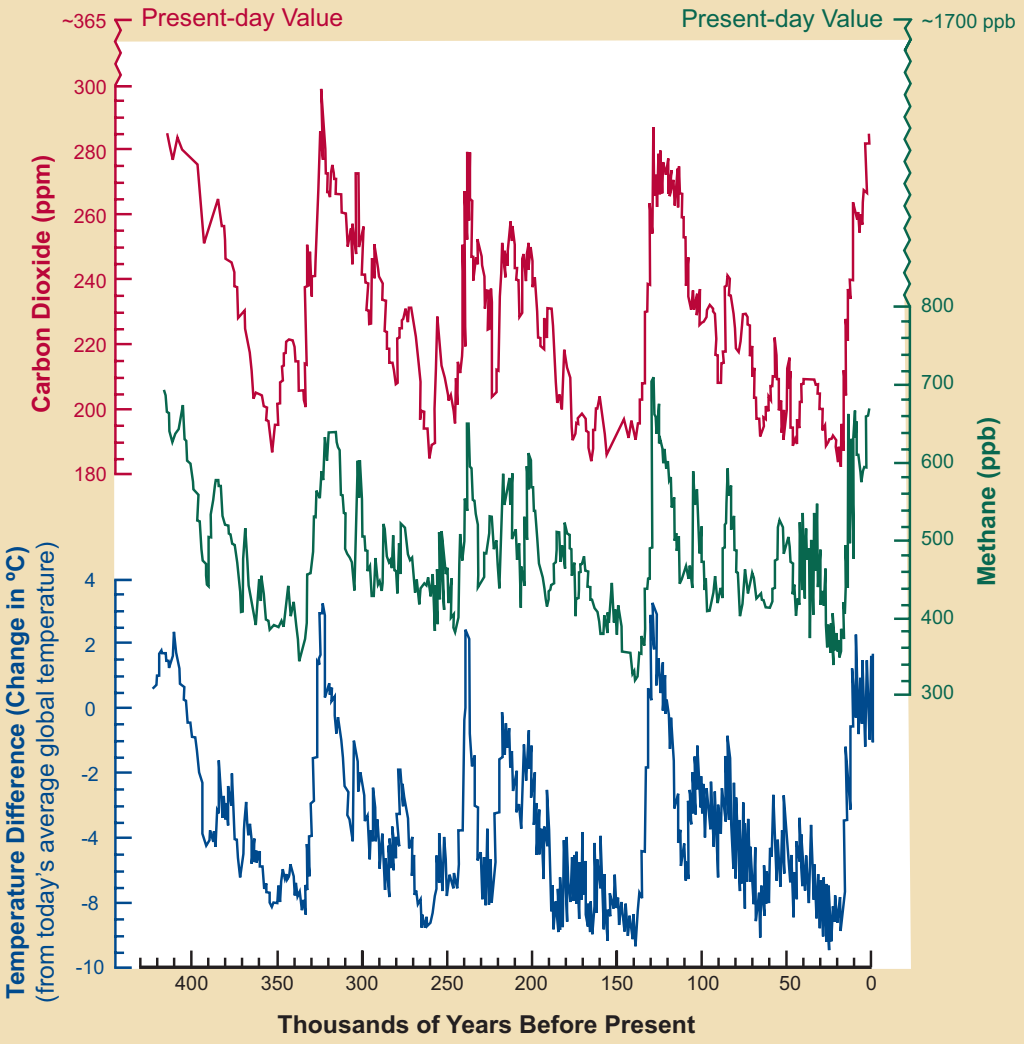
VA #8 Temperature Change on Earth Over Time



Notes: *These are the values measured in the ice cores.*

0 on the Y-axis indicates the average temperature over time, not the actual temperature. Other numbers on the Y-axis indicate the difference from the average temperature.

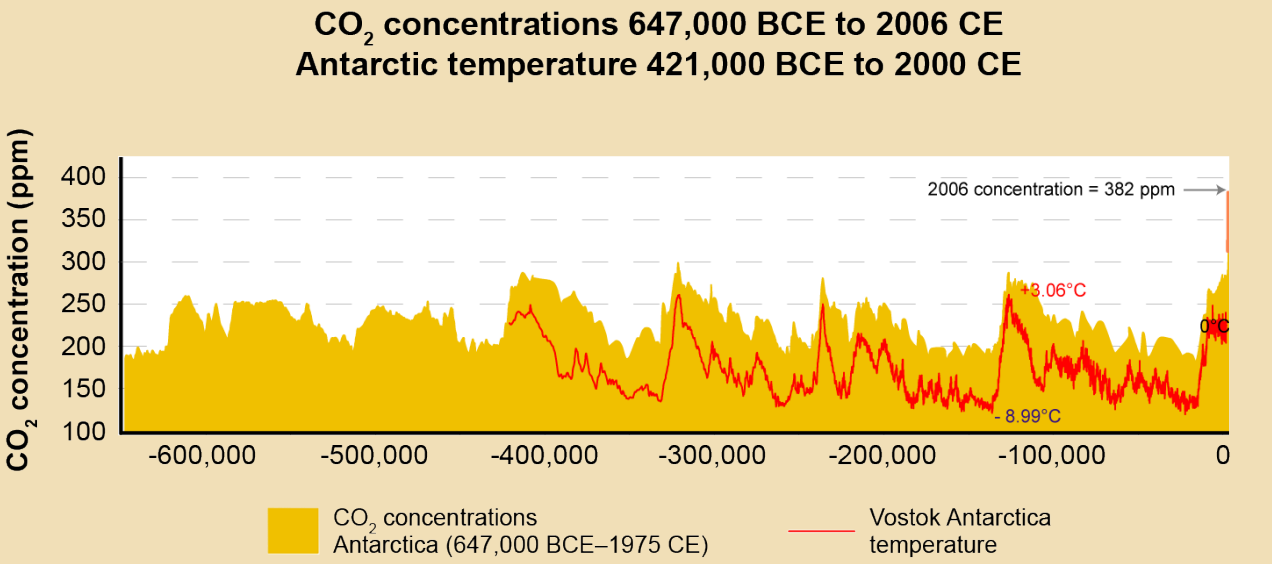
VA #9 Vostok Ice Core Data



Notes: *These are the values measured in the ice cores.*

0 on the Y-axis indicates the average temperature over time, not the actual temperature. Other numbers on the Y-axis indicate the difference from the average temperature.

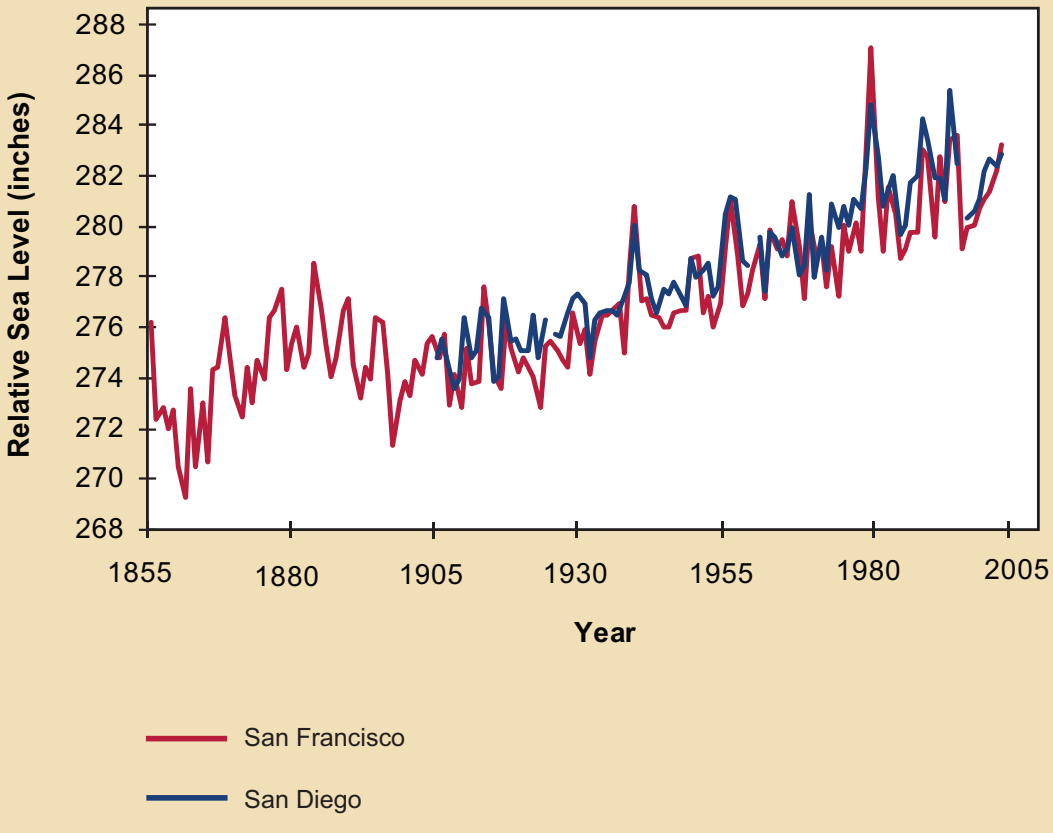
VA #10 Antarctic Temperatures and Atmospheric CO_2



**Antarctic temperature is measured as the change from the average conditions for the period 1850 CE–2000 CE*

Source: U.S. Environmental Protection Agency (2009) http://www.epa.gov/climatechange/science/pastcc.html

VA #11 Historical Sea-Levels for San Francisco and San Diego

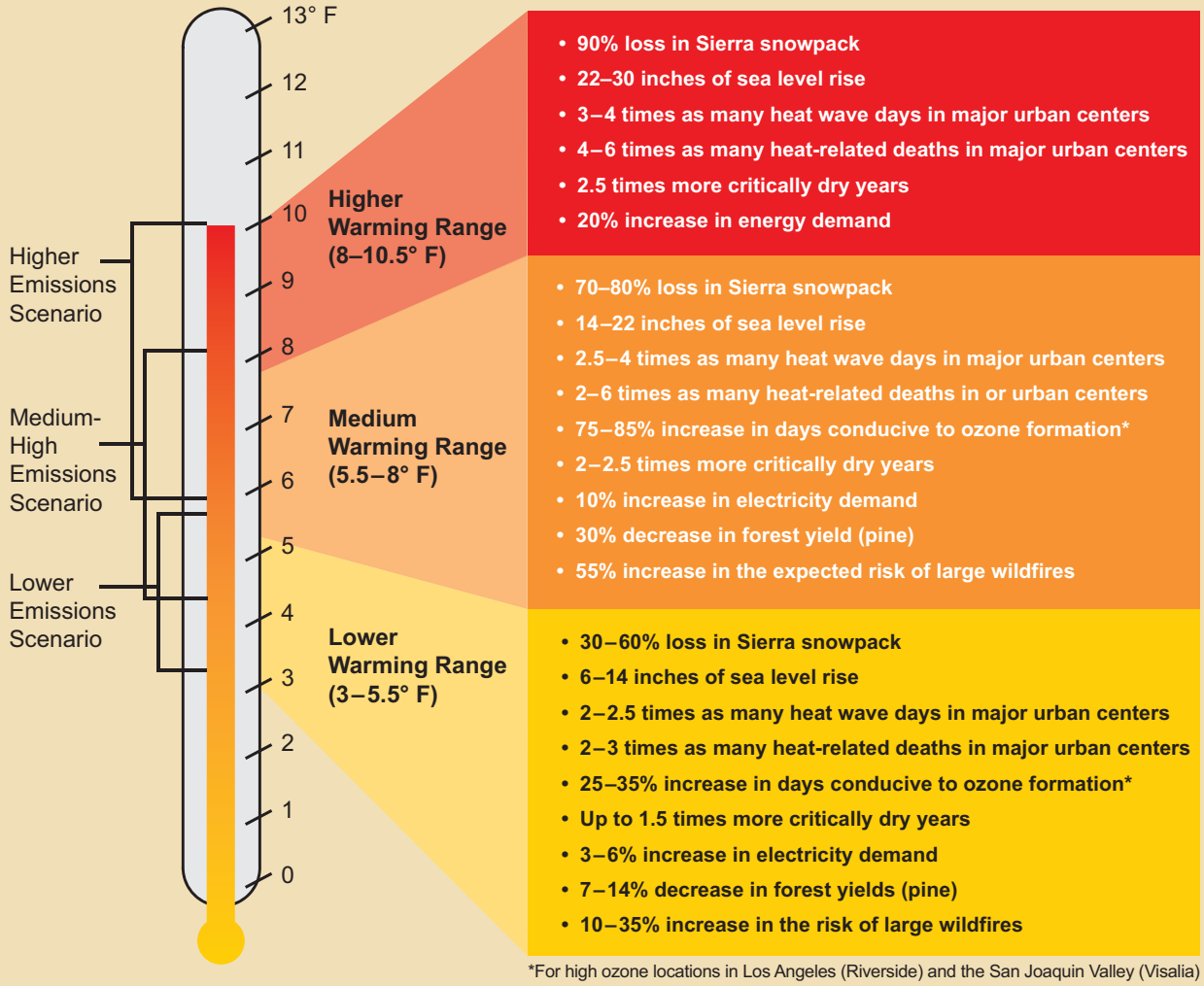


Source: Susie Moser, Guido Franco, Sarah Pittiglio, Wendy Chou, Dan Cayan, 2009. *The Future Is Now: An Update on Climate Change Science Impacts and Response Options for California*. (California Energy Commission, PIER Energy-Related Program, CEC-500-2008-071)

VA #12 Projected Global Warming Effects in California

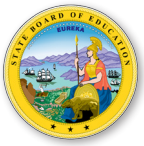
Summary of Projected Global Warming Effects, 2070–2099

(as compared with 1961–1990)



*For high ozone locations in Los Angeles (Riverside) and the San Joaquin Valley (Visalia)

Source: Union of Concerned Scientists (2006) http://www.climatechoices.org/impacts_overview/



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